C&EN

SCIENTIFIC NEWS FROM THE SAN FRANCISCO ACS NATIONAL MEETING

COSMETICS

Raw material suppliers boost service as market pressures grow

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CHEMICAL & ENGINEERING NEWS

C&EN

APRIL 20, 1992

NEWS OF THE WEEK

■ DNA fingerprinting is a valuable tool for solving criminal cases, says National Research Council panel, but strict technical standards for tests must be devised. Page 4

■ Union Carbide plans to sell its remaining interest in Union Carbide India Ltd., including its battery business and the plant at Bhopal, site of the 1984 methyl isocyanate disaster. Page 4

■ Englehard develops family of refinery cracking catalysts that dramatically increase yields of isobutylene—a precursor to oxygenates for use in gasoline reformulation. Page 5

■ Exhibit, symposium at Beckman Center for the History of Chemistry in Philadelphia honor noted organic chemist, the late Robert Woodward. Page 5

■ New York, eight other states, and two environmental groups sue EPA for not issuing final permit rules as mandated by the Clean Air Act. Page 6

■ Gradual phaseout of persistent toxic compounds used in or produced by industrial processes urged by U.S.-Canadian commission. Page 6

COVER: Worker at Maybelline's North Little Rock, Ark., plant removes lipstick from molds. Photo by Mark Morgan Photography

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BUSINESS

Sweden's Nobel Industries is scrambling to get back on track following financial problems and bank takeover. ■ U.K. capital spending is forecast to be down again this year. Page 9

GOVERNMENT

NSF study predicting shortfall of scientists wasn't accurate, but was used to justify increased funding requests, speakers at House hearing charge. ■ Chemical industry worries U.S. policies will affect its trade advantage. ■ Destruction of Iraqi chemical weapons is expected to begin this summer. Page 14

SCIENCE/TECHNOLOGY

A protein that binds specifically to cisplatin-DNA adducts has been found. ■ Durable, low-power electrochromic system will have applications in electrocatalysis and automotive design. ■ Scrap tires or heavy residual oil can be used with coal to produce liquid synthetic crude oil. ■ As use of alternative fuels begins to be phased in, producers and consumers will feel effects in their wallets. ■ Studies of fullerenes show they can have different shapes and can be made from ordinary types of coal. ■ Crystal structure of enterobactin bound to vanadium(IV) has been elucidated. ■ New method for coal liquefaction is being readied for commercialization. ■ Organized assemblies of molecules—molecular systems—can be designed to deliver drugs or destroy chemical warfare agents. ■ A metallated polymer may serve as a molecular wire. Page 19

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Depth of science knowledge among U.S. precollege students is uneven, though grasp of basic facts exists, a national survey finds. Page 28

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Carl Djerassi paints his life's portrait in his nontechnical autobiography, "The Pill, Pygmy Chimps, and Degas' Horse." Page 53

PRODUCT REPORT

Cosmetics suppliers strive to meet consumers requests for products that are milder to eyes and skin, environmentally friendly, and produced without animal testing. Page 31

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LETTERS

Cold fusion

In Wesley Murbach's letter to the editor (C&EN, March 9, page 3) he questioned the feasibility of cold fusion because, seemingly, the process appears to be much too simple. I am not a staunch believer that cold fusion can be achieved, but Murbach's comments encompass a larger issue. This is the criticism, and sometimes ridicule, that is often directed toward new ideas when the ideas don't conform to existing theories. I emphasize theory strongly because so much of chemistry and physics is based on theoretical concepts. Those who are quick to criticize new ideas may have forgotten that many existing scientific "facts" are in actuality educated guesses.

Brad Buecker
Springfield, Ill.

Oxygenated fuels

When the General Accounting Office (GAO) issued the report entitled "Oxygenated Fuels Help Reduce Carbon Monoxide," dated August 1991, they also invited readers to obtain more information from the appropriate authorities in the cities under study. I did that, and am left wondering about the wisdom of the project.

First, let us consider the good news. In all areas, there has been a steady reduction in CO levels over a period of years. In the case of Las Vegas, for example, a crude estimate of ambient CO for the worst days measured at one site and adjusted for a presumed increase in gasoline consumption dropped about 60% over a 15-year period. (On the other hand, two winters of oxygenated fuel use there perversely showed little change in CO and an increase in NO_x.) Albuquerque reports a 40% decline over six years in ambient CO in winter at the site with the highest level. During a decade of measurement at Arizona sites, the number of days in which the ozone level exceeded standard also diminished, even though peak readings did not. And then, there was roughly a 15- to 20-fold reduction in atmospheric lead at sites in Colorado and Arizona that would result from the phaseout of cars without catalytic converters using leaded gas. These are all to the good, but they are not the result of using oxygenated fuels.

What I am concerned about is this: The GAO report claims the use of oxygenated fuels alone will "not ensure compliance with national CO standards." Yet we are forcing expenditure of billions of dollars for the construction of refinery units mainly to manufacture methyl *tert*-butyl ether, the oxygenate of choice. As for ethanol, other sources claim the fermenation process is not economical without a subsidy, and for the required production would compete with food supplies. In any event, with ethanol, vaporization losses reportedly exceed contemplated standards.

I would think that incentives and penalties to reduce the consumption of gasoline would be far less costly and more effective than what we have embarked upon. But I guess that as long as the Saudis keep supplying us with cheap crude, there is no hope of having a conservationist policy prevail. Is this another example of "you can't get there from here"?

Charles V. Berger
Western Springs, Ill.

NIH's strategic plan

I wish to respond to the story on the National Institutes of Health's strategic planning process (C&EN, March 9, page 15).

Although the story was generally correct and accurate, I don't think the headline and blurb accurately reflect the strong endorsement of scientists and other participants to the NIH strategic planning process.

I attended two of the five regional meetings (Los Angeles and St. Louis). There was strong, even enthusiastic, support for a strategic planning process. In general there was strong commendation and appreciation expressed to Bernadine Healy and her staff for initiating the process.

The final strategic planning document will probably be much shorter, much more general, and more inclusive than the "framework for discussion" documents distributed in preparation for these meetings. The purpose of these meetings was to solicit suggestions, criticism, and input to the process. That is exactly what the biomedical research community did at these regional meetings.

Correction

• April 6, page 6: The third anniversary of the announcement of cold fusion was March 23, not March 27.

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ISP's in-house salon allows thorough testing of raw materials used in customers' new and existing products

Cosmetics Suppliers Rally To Meet Consumer Concerns

Susan J. Ainsworth, C&EN Houston

Judging from its several years of annual sales growth of roughly 3%, the nearly $17 billion U.S. consumer market for cosmetics and toiletries is a mature business. But it is far from being stagnant. As Janet Kosiek, a product manager in Lonza's performance chemicals group, Fair Lawn, N.J., puts it: "We are in an industry that's in a state of constant change."

Perhaps the biggest change in the industry has been its marked consolidation. Cosmetic and toiletry companies continue to merge as do the companies that supply their raw materials. In addition, government regulations are tightening their collective grip on producers of cosmetics and toiletries. "Regulatory changes have driven cosmetic product development for a long time. However, we're seeing an acceleration in this area based in large measure on volatile organic compound (VOC) reduction," says Ro Oteri, a marketing manager at International Specialty Products (ISP), Wayne, N.J.

At the same time, consumers are becoming more concerned about the mildness and environmental friendliness of personal care products. Some want hair and skin products that are less irritating to skin and eyes. Some want less packaging. Some demand that the products they buy not be tested on animals and that they contain natural ingredients. Many in the industry believe they are so busy reacting to regulations and customer expectations that there is less time available now for innovation and new product development.

Consumers also want more value for their dollar. This is the "biggest long-term trend in the personal care market. Consumers are looking for more performance from the products they use, without any substantial change in cost," says Frank J. Freiler, director of marketing for the Union Carbide subsidiary Amerchol, a specialty chemicals company specializing in the personal care and cosmetics industry. Consumers, he adds, increasingly are looking for single products that can do what two or three products used to do.

The bottom line is that marketers are being pressured to reformulate to meet these new demands. What's more, they are expected to do this with a leaner work force because their staffs have been combined and trimmed as a result of mergers.

Consequently, cosmetic and toiletry companies are calling on their raw material suppliers more than ever to help them meet these many challenges. In response, suppliers are fortifying their technical service programs. They have to be more knowledgeable than ever about their products and technology and must work closely with their customers to better anticipate and meet their needs.

Henkel photos

New formulations of personal care products help reduce skin, eye irritation

At the same time, raw material suppliers are suffering under their own consolidation pressures. "If you go back 10 to 15 years, the number of companies making surfactants and raw materials was much larger than it is today. Even though the number of 'available' companies has dropped, consolidation will continue," projects Larry Rosenberg, a consultant at Chem Systems, Tarrytown, N.Y. For example, companies will sell off divisions because they are underperforming or because they no longer fit their core objectives, he adds. As a result of this supplier-side reorientation, staffs at many raw material suppliers are mirroring those of their customers—leaner and more streamlined. The upshot: Suppliers need to meet more of their customers' needs and do it more efficiently than ever.

These pressures are having an impact on the direction of the cosmetics and toiletries business. "In the 1990s, we will most likely see continued consolidation and a focus on manufacturing efficiency and distribution rather than on the development of new products. We seem to be moving toward a commodity-type environment," notes John V. Venegoni, business manager for personal care products at Stepan, a specialty chemicals firm in Northfield, Ill.

Despite the many challenges this cosmetics and toiletries market poses, many companies still choose to compete in it. Currently in the U.S. more than 500 companies are peddling in excess of 20,000 brands. On the raw materials side, roughly 150 firms supply cosmetic and toiletry additives. One attractant may be the ample size of the industry. The value of industry cosmetic shipments was $16.8 billion in 1991, reflecting only 3% growth in constant dollars over 1990, according to the 1992 Industrial Outlook report on cleaning preparations and cosmetics issued early this year by the Department of Commerce. Net exports represented 6% of total shipments, the report adds.

The cosmetics and toiletries business encompasses many markets. The Commerce Department includes shaving preparations, fragrances, hair preparations, dentifrices, and cosmetics in its cosmetics classification. The companies producing products within these categories are engaged in manufacturing perfumes, cosmetics, bath salts, body powders, colognes, creams, lotions and oils, dentifrices, denture cleaners, deodorants, hair coloring preparations, tonics and scalp conditioners, home permanent kits, manicure preparations, mouthwashes, shampoos, soap-impregnated powders, suntan lotions and oil, talcum powders, toothpastes and powders, premoistened towelettes, and other toilet preparations.

Sales of perfumes are outpacing other segments, says a February 1991 report on cosmetic and toiletry additives done by the market research firm Freedonia Group, Cleveland. These data, like all growth rates in Freedonia's report (unless otherwise noted), include growth as a result of inflation. Perfumes are likely to expand 8.3% per year to $595 million in 1995. Perfumes generally have short product lives, which means that marketers are always developing products and introducing new ones. This factor and the trend toward perfumes targeted at specific demographic markets are expected to continue to fuel demand.

Sales of hair preparations are expected to increase 7.7% annually to $830 million in 1995, reports Freedonia. Growth in this market, dominated by surfactants and hair polymers, is being driven by such new products as gels, softer styling sprays, and spritzes. Trends include a move away from heavy conditioners and back to cream rinses, and the expansion of ethnic hair care product markets.

Shaving preparations are likely to expand more than 7% per year to $375 million in 1995. Trends in this market include a movement toward sensitive-skin formulations, skin conditioning products, and an expansion of products targeted at women. Meanwhile, cosmetic preparations markets will likely expand 6.8% per year to $275 million in 1995 based on strong demand for skin care products, many of them incorporating sunscreen additives. Dentifrice market growth is likely to occur because of increased consumer concerns about gingivitis and plaque, as well as new products directed at children.

Cosmetic and toiletry additives are a much smaller part of the $16 billion-plus cosmetics and toiletries finished goods market. Sales in the U.S. are forecast to grow 7.4% annually to $2.7 billion in 1995, with real growth (excluding inflation) reaching only 3.6% per year, according to the Freedonia study. Emollients and moisturizing agents make up the largest product segment in the market; they are expected to expand 7.2% annually to $880 million in 1995, Freedonia reports. "Growth will be based on demand for skin care compounds from a maturing population, increasing use of male-oriented products such as sensitive-skin shaving preparations, and healthy sales of sunscreen products." Opportunities will also arise for suppliers and marketers of vegetable and cas-

tor oils and other natural ingredients, says the report.

Freedonia expects fragrances demand to increase 8.8% per year to $865 million, "benefiting from the penetration of new target markets and ongoing product introductions." Although consumers currently favor natural essential oils, Freedonia anticipates makers of synthetic aroma chemicals will compete by introducing more accurate recreations of natural scents.

Hair polymer sales are expected to expand 7.2% per year to $85 million in 1995. Growth likely will come from strong demand for styling products such as mousses, the addition of conditioning agents in shampoos, and the introduction of hair waxes that impart shine and manageability to hair. Sales of waxes have already taken off in Europe, says the Freedonia study.

Freedonia forecasts that the use of surfactants in shampoos, cosmetics, and toiletry products (excluding soaps) alone will grow 3.6% annually to reach 582 million lb in 1995. Niche markets such as cosmetics for various ethnic groups and sun-care protection products will present opportunities for cosmetic companies marketing such end-use cosmetics and toiletries. Raw material suppliers who develop and market natural-based and milder formulations and surfactants with less residual odor will be able to achieve faster growth, the consulting firm predicts. Michael Gransky, a sales manager for Hüls America, agrees and adds that surfactants that contain no animal by-products and that are readily biodegradable have also gained prominence in the market within the past year.

Good opportunities are anticipated for amphoteric surfactants, because they are natural and extremely mild to the skin and mucous membranes, and have less residual odor—two characteristics in demand right now. Amphoterics, although they account for less than 1% of the total market and are among the most expensive surfactants, are important ingredients for many personal care products such as shampoos, and liquid and bar soaps, says another Freedonia report on surfactants completed in July 1991. With a very small sales base, and many newly developing applications, amphoterics are growing faster than the other three surfactant groups—anionics, nonionics, and cationics. Driven by the personal care market and increasing industrial specialty applications, amphoteric surfactants demand in all end uses is expected to expand 5% annually to 55 million lb in 1995.

Sales for another group of additives, those for sunscreens, are expected to increase 8.4% per year (including inflation) to $45 million in 1995, an increase that is benefiting from growing concern about the harmful effects the Sun can have on skin, coupled with the increasing inclusion of ultraviolet absorbers in items such as skin creams, shampoos, and lip balms, notes the Freedonia study. The silica division of Degussa, in Dublin, Ohio, has been riding this wave with an ultrafine-particle-size titanium dioxide product that blocks UV radiation without the white pigment usually associated with the compound. The absence of the white pigment makes the product suitable for use in a variety of cosmetic products, including mascaras, makeups, and lipsticks. Formulating products other than traditional tanning products is "a rapidly growing market," says Richard Cavagnaro, product manager of the division.

Demand for thickening agents, used in

Sales of cosmetic, toiletry additives will grow roughly 4% annually through 1995

$ Millions	1990	1995	2000	% annual change (1990–95)
Emollients & moisturizing agents	$ 621	$ 880	$1208	7.2%
Fragrances	567	865	1300	8.8
Surfactants	251	345	470	6.6
Propellants	138	180	220	5.5
Hair polymers	60	85	120	7.2
Biocides	55	75	100	6.4
Thickening agents	46	65	90	7.2
Nacreous pigments	35	45	57	5.2
Sunscreen additives	30	45	65	8.4
Other cosmetic additives	111	155	200	6.9
TOTAL	$1914	$2740	$3830	7.4%
ADJUSTED TOTAL ($ millions, 1990 = 100)	$1914	$2280	$2710	3.6%

Source: Freedonia Group

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nearly all cosmetics and toiletries, likely will grow 7.2% per year. Meanwhile, biocide sales can look for increases of 6.4% per year, totaling $75 million in 1995, says Freedonia. Nacreous pigment sales are expected to experience growth of only 5.2% per year because of the trend toward makeup that imparts a matte finish rather than the pearly luster provided by nacreous pigments. "Other cosmetic additives, consisting of such widely used products as dyes and pigments, will mirror gains in aggregate cosmetic and toiletry product shipments," says the Freedonia study.

Anionics most widely used in cosmetics, toiletries

	Consumption				
Millions of lb	1980	1985	1990	1995	2000
Anionics	155	233	345	415	485
Nonionics	37	49	55	62	70
Cationics	25	41	62	75	88
Amphoterics	13	16	25	30	38
TOTAL	230	339	487	582	681

Source: Freedonia Group

Soaps manufacture uses most personal care surfactants

	Consumption				
Millions of lb	1980	1985	1990	1995	2000
Soaps	512	610	750	795	840
Shampoos	170	266	405	485	567
Other cosmetics & toiletries	60	73	82	97	114
TOTAL	742	949	1237	1377	1521

Source: Freedonia Group

Technical service must be strong

Even while some segments of the additives market are ripe for growth, suppliers are having to work harder than ever to tap into them. Their customers, the cosmetic marketers, want suppliers to do more of the leg work and screening for them to streamline the cosmetics formulation work, says Hüls America's Gransky. To keep their customers happy, suppliers need to make the technical service component of their businesses stronger than ever, he adds.

For one, "cosmetics are much more elegant and sophisticated than they used to be. The simple cosmetics of 30 years ago have been replaced with technically more advanced products. That's why [cosmetic marketers] appreciate more customer service," says William E. Rosen, president of ISP subsidiary Sutton Laboratories in Chatham, N.J., a leader in the preservatives market.

But more significantly, this trend toward stronger technical service "goes hand-in-hand with the consolidation trend," says Lonza's Kosiek. Marketing companies that have merged with other companies have fewer people doing the same jobs so "they have higher work loads and they need help." ISP's Oteri adds, "Consolidation among the supplier's customer base and also paring down of our customer's R&D staffs," means the customer is placing "a greater requirement on suppliers to deliver much more applications data in support of their products, especially new ones."

Kosiek notes, "These days doing technical service is more than putting formulas together. Marketers want support on how our raw materials work and why they work. Customers want to know what variations in a formula will do and want a good general understanding of the chemistry." For example, "We know betaine [a carboxylate surfactant] combined with an anionic surfactant makes a good shampoo, but we also have to know why a certain ratio works best and what happens if we change the ratio or the pH, etcetera. A company that can explain why its product works or does not work has credibility, and credibility is important in this business."

There is also, Oteri says, "a developing trend among suppliers to work closely with customers at earlier stages of product development. This benefits both parties—the customer gets new technologies to the market faster while the supplier's product development process becomes more efficient."

Hüls' Gransky observes: "Companies are running leaner and they don't have the qualified personnel and money to screen 20 to 30 products to find the most suitable one. They are more sensitive than ever about the time outlay. Our people must be sharp and give them the most appropriate offering the first time around. When we do that, we shorten the customer's time to market."

One way suppliers and cosmetic companies can work together more closely is by forming partnership-type alliances, says Matthew F. Jurczyk, product manager for personal care chemicals at Akzo Chemicals, Chicago. With quality processes being adopted by many companies, these types of arrangements are becoming more common, he adds. "As the industry becomes more complex and segmented, our clients have unique needs and tight specifications on existing products. We try to accommodate them by customizing our products to meet those needs."

To respond to today's market environment, Oteri says raw material suppliers are also teaming up. "In order to meet developing environmental and performance needs," he says, "suppliers can't develop products in isolation. For example, research for tomorrow's new hairspray resins is stimulating ISP's scientists to become intimately aware of developing advances in packaging technology as well as progress of other chemical suppliers in the propellants and solvents areas."

Another trend that is emerging as competition grows more keen is that some companies are working harder to bring new innovations to the cosmetic companies more often rather than serve a reactionary role. Ninety percent of the time, marketers drive the trends and raw material suppliers scramble to meet their needs. That's because the cosmetic companies have direct customer contact and generally pick up on the trends first.

One company, which does not want to be identified to avoid alerting its competition, has adopted a market research program that will allow it to get closer to the market and better tuned into consumer demands. "This will allow us to be a more efficient supplier of technology and innovation to our customers," a marketing manager at the company adds. "As a supplier we can bring the most value to our customers if we can help them kick off a trend."

Indeed, cosmetic raw material suppliers have had to refocus and accelerate their technical service support operations to retain and please valued customers. Making this even tougher is that suppliers' businesses are also merging, closing as a result of unbearable regulatory pressure, or becoming leaner.

The anionic surfactant business, for example, is down to only a handful of suppliers, says Stepan's Venegoni. "Regulatory pressures have forced several

companies in this business to close their doors. The companies that are left have been focusing on increasing capacity to meet the increased demand for their products."

Focus on logisitics rather than innovation

With the pressure to pick up this kind of slack in the market, "it appears that both suppliers and their customers have less time and fewer resources available for new product introductions," says Venegoni. For example, "in the shampoos business, there seem to be fewer brands on the shelves than there were just five years ago and a handful of companies make most of them," he notes.

That kind of culling is true not only for the shampoo market. Almost 60% of cosmetic and toiletry sales are controlled by 10 companies, notes the Department of Commerce report. Says Venegoni: "Companies are taking advantage of their economies of scale. It appears that this business, particularly in the shampoo area, is becoming commodity-driven."

Contributing to this shift in emphasis from innovation to logistics is the stifling effect that the consolidation of the industry has had on efforts of many entrepreneurial-type companies, says Venegoni. Many of these companies have been acquired or merged with larger organizations or exited the market as a result of the escalating costs of doing business.

Another obstacle to new product innovation is that "the cost of introducing a new product has become exorbitant," says Venegoni. "Developmental and marketing costs are reaching the point where many companies can no longer afford to develop and launch a new product unless it can offer unique benefits to the consumer."

Regulations stifling product development

Complying with regulations also is adding significantly to the cost of introducing a new product. "In general, a great deal of our customers' R&D time is being spent reformulating existing products to meet regulatory requirements," says Venegoni. "That means there are fewer resources available for exploring new products."

Indeed, the biggest change in the cosmetics and toiletries business during the past few years has been the increasing pressure of regulatory issues, led by the actions of the California Air Resources Board (CARB), says Lonza's Kosiek. At its annual meeting last month, the Cosmetic, Toiletry & Fragrance Association (CTFA) identified air quality legislation as its number one concern currently.

There has been some good news for the industry, though. In January CTFA was successful in persuading CARB to modify its proposed regulation governing the VOC content of personal fragrance products. The new proposal, which was adopted by the board at a Jan. 9 hearing, was modified to take into account the technical impossibility of reformulating existing fragrances to reduce the alcohol content and to allow more time to phase in more realistic VOC limits for future products, says CTFA.

The regulation adopted by CARB exempts existing personal fragrance products from the VOC limits and provides that all "products in development" by April 1, 1992, will be exempted, provided those products are registered with CARB by July 1, 1993, and sold in California prior to Jan. 1, 1994. Future personal fragrance products will be subject to VOC limits in two stages taking effect on Jan. 1, 1995, and Jan. 1, 1999.

Still, dealing with CARB's regulations for personal fragrances is just one third of the battle. The first wave of activity occurred back in 1988 when California amended its Clean Air Act and then set an informal goal to reduce VOC emissions from consumer products 50% by the year 2000. The antiperspirants and deodorants category was the first one targeted; in November 1989, the board adopted regulations that would dramatically reduce VOCs in these products by 1995. The regulation poses the biggest threat to aerosol producers, who will find it difficult to reformulate to meet such a deadline, says Thomas J. Donegan Jr., CTFA general counsel. With that in mind, CTFA is now pursuing several initiatives to obtain more time and more reasonable VOC limits for this category.

The second wave of CARB activity took place in 1990, Donegan says, when the board proposed the "first really broad consumer products regulation covering, among other things, five different personal care product categories—hairsprays, hair styling gels, hair mousse, nail polish remover, and shaving cream." The most worrisome to the industry is probably the hairspray portion of the regulation, which now calls for an 80% VOC limit by January 1993. And he adds, "CARB wants to change that limit to 55% by 1998 and that's a problem. This is what CARB calls a technology-forcing regulation. CARB figures if it holds our feet to the fire long enough, someone will figure out a way to reformulate to meet their limits."

Although most of the air quality activity is now centered in California, other states are following close behind. For example, late last month New York State's environmental board approved a proposal that will set VOC limits similar to those of California for antiperspirants, deodorants, and hairsprays, says

Workers in Maybelline's plant in North Little Rock, Ark., assemble eye shadow makeup kits

Donegan. Lonza's Kosiek adds, "People are afraid there will be 50 different regulations they have to comply with, but that's very unlikely because states tend to model their laws after one another." Still, Donegan says, regulations from state to state can differ just enough—for example in their enforcement dates—to make life difficult for producers.

"These regulations and issues will impact everything in personal care" and will dictate everything from what products are developed to what drives technology in the future, Kosiek adds.

Reformulations of existing products designed to get around these regulatory hurdles are already becoming evident in the marketplace. For example, last year the European Designer Fragrance Division of Cosmair introduced Anais Anais' Voile de Parfum, a fragrance product made using alcohol-free technology. The company claims its product, which replaces a fragrance's alcohol content with moisturizers, has proven so effective and has been so well received by consumers that Cosmair has decided to launch other such products. Last month it brought to market its Paloma Picasso Satin de Parfum, another moisturizing perfume mist without alcohol. Still, Cosmair has not been successful in exactly re-creating the original alcohol-based scents. The company claims the new product form "has all the elegance of the Paloma Picasso's original perfume, but that the absence of the alcohol removes the headiness or topnotes."

Indeed, reformulation to comply with regulations has its challenges. Says ISP's Oteri: "The promulgation of 80% VOC hairspray products regulation in California and other states did not leave industry very much time to respond through innovation." Today's hairspray resins were designed for anhydrous systems. Cosmetic industry groups have estimated it could take as many as seven years to develop new resins from scratch, he adds. ISP responded to the rapidly changing market requirements by making incremental changes to their popular Gantrez brand ES hairspray resins. "The new products—Gantrez brand V resins—mitigate the deleterious effects of water in 80% VOC hairspray formulations. Marketers can now comply with the regulations without compromising hair holding, drying time, or tactile performance properties," adds Oteri.

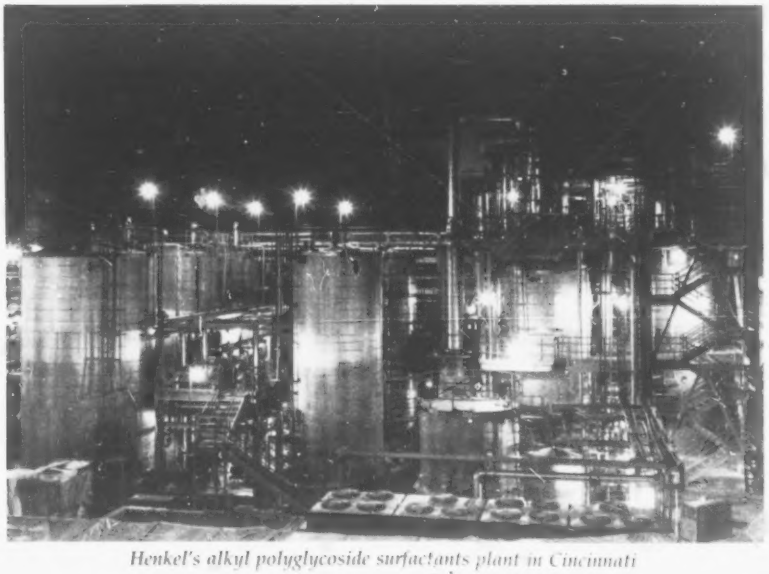
Similarly, within the past two years Akzo Chemicals has introduced a new product into the hair care market to help its customers address changing regulations. The trademarked product, Arquad HTL8, a branched quaternary salt, is offered in a high active liquid version using water as a solvent. This helps meet the need to develop formulations without using alcohol-based products, says Akzo's Jurczyk. Cosmetic companies are increasingly concerned about the odor, safety, and handling issues associated with alcohol, he adds. "Arquad HTL8 offers the kind of intense conditioning normally associated with dialkyl quaternaries typically available in paste or solid form. Formulators would rather handle liquids, which can be easily pumped. Solids must be melted—creating another processing step."

Raw material suppliers are also experiencing the effects of another piece of legislation originating in California—Proposition 65. This law, adopted as a voter initiative in 1986, requires the state to identify substances known to be carcinogens or reproductive toxicants. Now, the state has identified over 400 such chemicals. The manufacturer of any consumer product containing such a chemical, even as a contaminant, is required to warn of exposure to such chemicals unless they can demonstrate there is no significant risk from that exposure. Significant penalties can be imposed for failure to warn. Although food, drugs, and cosmetics and medical devices in compliance with other federal and state safety requirements are exempted from some cancer-warning requirements of Proposition 65, that exemption has been challenged in court in California. These products remain subject to warning requirements for reproductive toxicants, says CTFA.

Because of continuing concerns about application of these warning requirements, cosmetic and toiletry companies are taking a careful look at their formulas, and are looking to their suppliers to tell them with great certainty and accuracy what is in the raw materials they are buying. Raw material component disclosure "is not a clear-cut, black and white issue," says Jurczyk. Very few companies sell chemically pure materials; most ingredients are actually complex mixtures and may contain numerous by-products, he explains.

The suppliers that will survive the regulatory environment created by rules such as Proposition 65 "will be those that can provide the greatest toxicology and regulatory support for their products," says Jurczyk. As a result, "more companies need fully staffed regulatory and toxicology departments to address these types of issues and provide sophisticated responses to customer inquiries. Even in the last two years, I have seen the number of these types of customer requests jump dramatically."

Likewise, Barbara Pagliocca, marketing manager for chemical specialties at



Henkel's alkyl polyglycoside surfactants plant in Cincinnati

Hüls America, observes: "Our customers are much more interested in getting toxicological information up-front as well as dermal testing and safety data. They now have to be much more precise about what is in their products." As a result of these concerns, companies are cutting down on the number of new raw materials they sell unless those materials serve a new function or provide a dramatic cost savings, says Pagliocca.

Alternatives to animal testing sought

The sticky issue of animal testing is another factor that is driving companies to reformulate existing products and ingredients rather than develop new ones. For several years some cosmetic companies have stepped up efforts to promote the fact that their products are not tested on animals, in response to consumer concerns. For instance, the Body Shop, a fast-growing cosmetic company that prides itself on social activism, says it "insists that the manufacturers and suppliers of our ingredients provide regular written confirmation that they have not carried out any animal testing—nor has any testing taken place on their behalf—on those materials within the previous five years."

Indeed, marketers have been ahead of raw material suppliers in making these claims, possibly because it has been more crucial to their businesses and possibly because making such claims has been easier for them. "Even if a cosmetic company says a final formula is not tested on animals, there's a chance that somewhere down the line its ingredients were animal tested by one of their suppliers or someone else in the industry," says one source.

But raw material suppliers are experiencing more of the heat of the debate on animal testing and they are moving toward the possible solution of using alternative tests—a still uncertain path that many cosmetic and personal care companies have already taken. For example, this past January the American subsidiary of Rhône-Poulenc signed a scientific collaboration agreement with InVitro International, a company that produces proprietary alternative tests that don't use animals. The tests can be used to evaluate the potential irritation to humans posed by a wide variety of chemicals and compounds found in cosmetics, household goods, and industrial products.

Dugussa's Sipernat precipitated silicas serve as thickening, adsorption agents in cosmetics

Rhône-Poulenc's surfactants and specialties division, Cranbury, N.J., is now using InVitro International's Eytex and Skintex methods to measure the irritancy and toxicity of its current products and in the joint development of low-irritation surfactant protocols. The Eytex and Skintex assays are based on highly ordered macromolecular models and have been used by major companies worldwide, says InVitro. These assays have consistently demonstrated the ability to accurately predict ocular and dermal irritancy, with an error rate of 7 to 10%, according to InVitro. "The Draize tests, which use live rabbits, have an error rate as high as 40% and are considered too costly and time consuming to use for optimizing product formulations," adds InVitro. Says James Manier, business director for personal care at Rhône-Poulenc's surfactant and specialties division: "The adoption of InVitro's advanced in-vitro methods will help us develop advanced surfactants and formulas that are nonirritating and will extend our leadership position in mildness."

Still, doing any testing other than tests in animals can be risky for raw material suppliers. The Food & Drug Administration recognizes no other safety tests as acceptable. Thus, raw material suppliers that opt not to test on animals risk facing liability issues later on, notes Lonza's Kosiek. "It gets into a real gray area."

The bottom line is that raw material suppliers still have to do what ultimately pleases their customers. "We are following the animal testing area very closely and are looking at alternatives. But we take our cues, not from the general public, but from our customers. We will do any testing that our customers feel is important and necessary," says one source.

If nothing else, the animal testing issue has made companies think harder about when testing on animals is really necessary—for both humanitarian and economic reasons. "There was a time when animal testing was done to more of an extreme, but for the last few years the efforts have been scaled back as much as possible by the industry," says Kosiek.

These days, Hüls' Gransky says, companies will animal-test only if they absolutely need to validate other test modes. Many companies are doing away with in-house animal testing. The expense and hassle of animal testing has forced many companies "to stay with their existing menu of raw materials" and launch a new product only if it will yield immediate benefits for the company, Gransky adds.

Consumers demanding mild formulations

Although regulations and animal testing issues are making it increasingly expensive and difficult for the industry to develop and launch new products, companies still have to stay innovative in order to meet consumer demands for new formulations.

Not surprisingly, consumers are thinking more than ever about product safety and are demanding milder hair and skin products. The controversy stirred up by various regulations and

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animal rights activists may be part of what's behind this trend. Another force driving the materials changes toward mildness may be the aging population, which is growing in size and thus becoming a major market, notes Kosiek. Older skin needs products that are less harsh and that have fewer degreasing additives. Some ingredients strip hair and skin of moisture much more than others, she notes.

Seeing this trend, Lonza and companies like it have focused some of their research efforts on "how to expand their product lines to make products that are more efficacious and safe," says Kosiek.

Amerchol's Freiler says during the past two years the firm has been working to expand its product line of natural glucose-based raw materials to add other functional properties to these materials. "One example is Glucquat R 125, a cationic material that adds substantivity to the known humectancy and mildness properties of our methylglucose-based materials."

Other companies are adding milder surfactants to their product portfolios and expanding capacity for them. For example, Rhône-Poulenc's surfactants and specialties division says it will soon announce a $5 million expansion of its Geropon sodium cocoyl isethionate (SCI) plant at Winder, Ga. This mild surfactant is used in bar soaps such as Lever 2000, which has gained great acceptance despite its recent introduction into a market dominated by mature brands. SCI also is used in liquid soaps, facial cleansers, and bath products. "We are looking at all of our primary surfactants to see how we can make them more natural, milder, environmentally safe and avoid testing them on animals. Everybody is looking at these factors; they are what is driving any new product development," says Rhone-Poulenc's Manier.

Henkel recently started up a 25,000-metric-ton-per-year alkyl polyglycoside surfactant plant at its Cincinnati, Ohio, production facility. The unit is part of an investment of more than $120 million that also includes a 40,000-metric-ton-per-year fatty alcohol plant, scheduled to begin operating in the third quarter of this year.

According to Anthony DeRose, vice president of Henkel's Cospha Division in Ambler, Pa., Henkel's new surfactants, tradenamed Plantaren, have very

good foaming properties in the presence of sebum and are extraordinarily mild to skin and eyes as well as being biodegradable. Henkel's alkyl polyglycoside surfactants are being used in a variety of personal care applications including shampoos, hair conditioners, facial cleansers, and bath products. DeRose points out that its mild line of alkyl polyglycoside surfactants is made from renewable raw materials—glucose derived from corn and fatty alcohols from coconut and palm kernel oils.

Henkel is li' 'v getting a lot of marketing mileage ... of its products being natural based. That's because many consumers equate natural with mildness and safety. The trend toward "natural ingredients and natural-based products" has accelerated over the past few years. Fast-growing companies like the Body Shop have based much of their success on their marketing of so-called natural products, such as a foot scrub containing Greek volcanic pumice stone or a moisturizer based on mango butter and sweet almond oil. Avon has touted its new Anew Perfecting Complex for Face as based on glycolic acid, which is an alpha hydroxy acid derived from sugar cane. "Studies over the past 20 years clearly demonstrate that alpha hydroxy acids can improve the overall quality of the skin—minimizing the appearance of fine, dry lines and wrinkles," says Alex Znaiden, director of R&D at Avon Skin Care Laboratories, New York, N.Y.

Many raw material suppliers believe "the natural issue is more consumer perception than anything," says Kosiek. Thus producers of synthetic raw materials have an uphill battle convincing today's consumers that their products can be just as mild as natural-based ones.

Says John M. McChesney, manager of marketing communications for Ethyl's chemicals group in Baton Rouge, La., "Mildness and reduced toxicity are not necessarily tied to botanical-based materials. Many cosmetic chemists understand this and select raw materials with the desired performance characteristics." For example, the company's Ethylflo polydecenes "provide the performance and safety properties desired by the chemist and the consumer." These fully hydrogenated decene oligomers are base fluids with low toxicity

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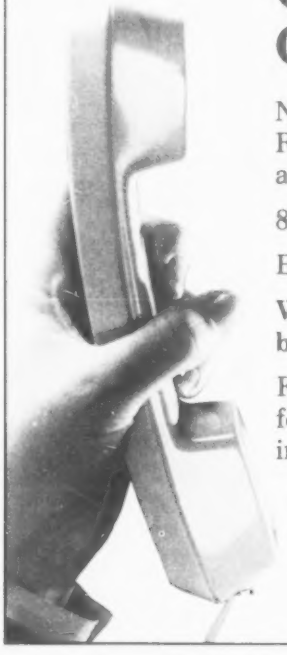

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Contrary to consumer perception, raw material suppliers are quick to point out that natural is not always better. For example, poison ivy is a natural product that is not good for skin contact, says Kosiek. Many synthetic products are purer, safer, and milder than naturally produced materials.

"There's a lot of inconsistency in nature. Nature does not grow itself according to specification," Huls America's Paglilocca points out. "The less controlled a production process is, the more you might expect to have problems," she adds. For example, cocoa butter substitutes have a narrow melting temperature range so it is easier to use them in a production batch than natural cocoa butter, which has a wider and less predictable range.

In general, the new breed of natural products are also harder to preserve, notes Rosen of Sutton Laboratories. "It can be done well, it's just more challenging." Certain ingredients such as some proteins and emulsifiers tend to inactivate the preservatives, he explains. "And if a preservative does not do its job, you know it. Its role is not a vague conceptual one such as is the case with emollients or humectants."

Natural ingredients are also much more limited in scope and functionality than synthetics. The challenge to formulators is to use more environmentally friendly ingredients but not to lose any of the performance of existing products. "It's easy to make a good performing product or an environmentally friendly product. It is hard to do both in one product," says ISP's Oteri. Consumers, he points out, no matter how much they want to support the environment, won't buy a more environmentally friendly product if it does not perform as they expect it should.

Producers of synthetic ingredients point out that natural-based raw materials are not always more environmentally friendly, either. For example, palm oil and coconut trees have to be treated with fertilizers and pesticides. "Then the oils must be treated chemically to get the surfactants," says Eric Spore, a product specialist in the olefins and derivatives division of Chevron Chemical, Houston, which makes additives for sunscreens and intermediates for a variety of personal care and cosmetic

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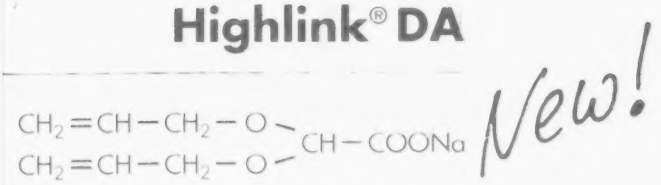

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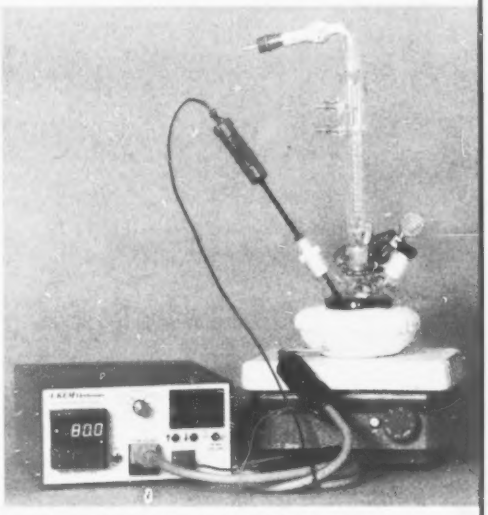

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products. "On a life-cycle basis, synthetics are safer, purer, and kinder to the environment," he adds.

Quest for value creates challenges

Another consumer trend that is driving new product development is the quest for value. The 1990s are marking a change in consumer psychology, CTFA president Edward Kavanaugh, said at the association's annual meeting. "There's a new focus on value, and value is now fashionable."

It is not surprising, then, that one of the biggest changes in the cosmetics and toiletries market recently has been the "explosive growth of two-in-one products," says Akzo's Jurczyk. Ever since Procter & Gamble introduced its Pert Plus product, which is a shampoo and conditioner in one, marketers have been trying to follow suit. Now, seven or eight producers have two-in-one shampoos. They realize that selling consumers on multifunctionality is easier than selling on the benefits of a "green" product, for example, because the consumer can more easily perceive a difference, explains Lonza's Kosiek. "That's why multifunctional products are the hottest thing in the cosmetics and toiletries business right now," she says.

The consumer gets the performance properties from a shampoo that usually required the use of an after-shampoo rinse or conditioner, says Amerchol's Freiler. As a result, "the consumer saves time, effort, and probably a little money," he adds. In skin care, the use of sunscreens in daily moisturizers and the addition of conditioning properties to cleansers are other emerging examples of this multifunctionality trend.

Many raw material suppliers are marketing their products with the same benefits in mind. For example, Akzo's Arquad HTLS provides conditioning properties while acting as an emulsion stabilizer, says Jurczyk. Rhône-Poulenc's surfactants and specialties unit continues to develop its Jaguar guar-based polymers for two-in-one hair care products. The technology was developed to get around silicone technology, which is what Procter & Gamble uses in its Pert Plus, for which the company has patent protection. Stepan, however, has found a way to use silicone technology for multifunctional shampoos that is not included in Procter & Gamble's patent. Stepan's TAB-2 product allows formulators to suspend silicone, which provides conditioning properties, into a shampoo. The product has been on the market for about a year.

Indeed, raw material suppliers are having to jump through more hoops to thrive in their businesses. The increasing demands of consumers and various regulatory agencies are making life more difficult for cosmetics and toiletries producers and their suppliers are scrambling to help them meet these challenges. The cosmetics and toiletries business "used to be a black magic industry, but now that's changed," says Kosiek. "Raw materials suppliers must demonstrate the benefits of their products rather than just theorize what those benefits might be." □

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The Life of Carl Djerassi

Reviewed by Rudy M. Baum

Distinguished chemist's autobiography traces a remarkable life of scientific accomplishment and social involvement

■

"The Pill, Pygmy Chimps, and Degas' Horse" by Carl Djerassi, Basic Books, 10 East 53rd St., New York, N.Y. 10022, 320 pages, $25

Purely on the basis of his scientific achievements, Carl Djerassi must be considered one of the preeminent organic chemists of the 20th century. In a career that has spanned almost five decades, Djerassi has been active in the development of new medicinal agents, including the synthesis of the first active oral contraceptive; the isolation, structure elucidation, and partial synthesis of several hundred natural products; and investigations into aspects of the biological function and biosynthesis of those natural products.

Perhaps most important scientifically, Djerassi has played a central role in developing several physical methods for the solution of stereochemical and structural problems in chemistry. His research has led to the publication of more than 1100 papers and seven books, which he either authored or coauthored. This year, the American Chemical Society awarded him its highest honor, the Priestley Medal, in recognition of his accomplishments.

Although many distinguished chemists make important contributions to society outside of their scientific discipline, Djerassi is unique in the breadth of those outside achievements. He has been a very successful businessman. He has written extensively on the social impacts of science and technology, especially contraceptives. He is a patron of the arts, originally as a collector, notably of the works of Paul Klee, and now as the guiding force behind the Djerassi Foundation's Resident Artists Program, a major artists' colony located on Djerassi's ranch south of San Francisco. And he is an artist in his own right, as the author of a collection of short stories, a collection of poetry, and the 1989 novel "Cantor's Dilemma."

This brimming life is the subject of Djerassi's new book, "The Pill, Pygmy Chimps, and Degas' Horse." Djerassi calls the book his nontechnical autobiography (ACS published Djerassi's chemistry autobiography, "Steroids Made It Possible," in 1990), but it's not, really, in the traditional sense of an autobiography being a narrative account of one's life. Rather, the book consists of a series of factual stories, in which Djerassi is the main character, and essays, in which Djerassi the chemist, social philosopher, and artist argues his case. In combination, these stories and essays paint their portrait in broad bright brush strokes. Djerassi approaches biography as Impressionists approached painting.

He is well aware of this, of course. He has become in the past decade an accomplished literary stylist. In the book's final chapter, "Mind the Gaps," he writes: "Everything that can be said about the self-indulgence, the deviousness, the deliberate or subliminal image massaging, of autobiographical writing has doubtless been said many times; nor is it original, I suspect, to compare autobiography and Swiss cheese. The holes in a life account may be planned or inadvertent, but they are there; self-reflection and disclosure must pass through one's particular psychic filters." But the holes, he maintains, contain vital information. "Filling the gaps in an autobiography serves no more purpose than filling the holes in Swiss cheese," he writes. "My memory, my sense of shame, and whatever residual discretion is left me guarantee that the fillers I provide are false. . . . The gaps, large as they may be, are thus more honest, a truer reflection of my nature. Freud's insight applies with full force: the unconscious speaks through the gaps in ordinary language. Readers will gather from my prose intelligence about me of which I remain unaware."

"The Pill, Pygmy Chimps, and Degas' Horse" is a delightful, fascinating, sometimes hilarious and sometimes tragic book. A reader comes away from it with the sense that he or she has spent time with a charming and interesting individual and a towering intellect. Although it is written for nonscientists, and quite successfully presents a fair amount of complex chemistry in an accessible fashion, I think scientists will most appreciate Djerassi's effort because his life is a magnified, outsized version of their own lives.

In the book's introduction Djerassi writes, "With this autobiography I want to make a point that is particularly relevant in these days of scientific illiteracy and anti-intellectualism: scientists are not necessarily narrow specialists, communicating in an incomprehensible language and dealing in the cloistered ambiance of their laboratories with subjects far removed from everyday concerns. They can be as widely curious, and as self-centeredly imperfect, as scholars and thinkers in any intellectual endeavor and, at the same time, involve themselves with burning social issues." Using himself as the principal, but by no means only, example, Djerassi convinces the reader that some scientists, at least, are today's true Renaissance women and men.